

**$\Delta(1940) 3/2^-$**  $I(J^P) = \frac{3}{2}(\frac{3}{2}^-)$  Status: \*\*

## OMITTED FROM SUMMARY TABLE

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

 **$\Delta(1940)$  BREIT-WIGNER MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1940 to 2060 (<math>\approx</math> 2000) OUR ESTIMATE</b>			
1995 $\pm$ 105 - 60	ANISOVICH	12A	DPWA Multichannel
2058.1 $\pm$ 34.5	CHEW	80	BPWA $\pi^+ p \rightarrow \pi^+ p$
1940 $\pm$ 100	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1990 $\pm$ 40	HORN	08A	DPWA Multichannel
2057 $\pm$ 110	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

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→ UNCHECKED ←

 **$\Delta(1940)$  BREIT-WIGNER WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
450 $\pm$ 100	ANISOVICH	12A	DPWA Multichannel
198.4 $\pm$ 45.5	CHEW	80	BPWA $\pi^+ p \rightarrow \pi^+ p$
200 $\pm$ 100	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
410 $\pm$ 70	HORN	08A	DPWA Multichannel
460 $\pm$ 320	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

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 **$\Delta(1940)$  POLE POSITION**

REAL PART	DOCUMENT ID	TECN	COMMENT
<u>VALUE (MeV)</u>			
1990 $\pm$ 100 - 50	ANISOVICH	12A	DPWA Multichannel
1900 $\pm$ 100	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1915 or 1926	<sup>1</sup> LONGACRE	78	IPWA $\pi N \rightarrow N\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1985 $\pm$ 30	HORN	08A	DPWA Multichannel

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-2xIMAGINARY PART	DOCUMENT ID	TECN	COMMENT
<u>VALUE (MeV)</u>			
450 $\pm$ 90	ANISOVICH	12A	DPWA Multichannel
200 $\pm$ 60	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
190 or 186	<sup>1</sup> LONGACRE	78	IPWA $\pi N \rightarrow N\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
390 $\pm$ 50	HORN	08A	DPWA Multichannel

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 **$\Delta(1940)$  ELASTIC POLE RESIDUE**

MODULUS   $r$	DOCUMENT ID	TECN	COMMENT
<u>VALUE (MeV)</u>			
4 $\pm$ 4	ANISOVICH	12A	DPWA Multichannel
8 $\pm$ 3	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
<b>PHASE <math>\theta</math></b>			
<u>VALUE (°)</u>			
135 $\pm$ 45	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$

NODE=B136220

NODE=B136RER

NODE=B136RER

NODE=B136IMR

NODE=B136IMR

**$\Delta(1940)$  DECAY MODES**

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Mode	
$\Gamma_1$	$N\pi$
$\Gamma_2$	$\Sigma K$
$\Gamma_3$	$N\pi\pi$
$\Gamma_4$	$\Delta(1232)\pi$ , S-wave
$\Gamma_5$	$\Delta(1232)\pi$ , D-wave
$\Gamma_6$	$N\rho$ , $S=3/2$ , S-wave
$\Gamma_7$	$N(1535)\pi$
$\Gamma_8$	$N a_0(980)$
$\Gamma_9$	$\Delta(1232)\eta$
$\Gamma_{10}$	$N\gamma$ , helicity=1/2
$\Gamma_{11}$	$N\gamma$ , helicity=3/2

 **$\Delta(1940)$  BRANCHING RATIOS** **$\Gamma(N\pi)/\Gamma_{\text{total}}$** 

VALUE (%)	DOCUMENT ID	TECN	COMMENT	$\Gamma_1/\Gamma$
18	CHEW	80	BPWA $\pi^+ p \rightarrow \pi^+ p$	
$5 \pm 2$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$	
<b>• • • We do not use the following data for averages, fits, limits, etc. • • •</b>				
9 ± 4	HORN	08A	DPWA Multichannel	
18±12	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$	

 **$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\pi \rightarrow \Delta(1940) \rightarrow \Sigma K$** 

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
<0.015	CANDLIN	84	DPWA $\pi^+ p \rightarrow \Sigma^+ K^+$	

 **$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\pi \rightarrow \Delta(1940) \rightarrow \Delta(1232)\pi$ , S-wave**

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

+0.11 ± 0.10	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
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 **$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\pi \rightarrow \Delta(1940) \rightarrow \Delta(1232)\pi$ , D-wave**

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

+0.27 ± 0.16	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
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 **$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\pi \rightarrow \Delta(1940) \rightarrow N\rho$ ,  $S=3/2$ , S-wave**

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_6)^{1/2}/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

+0.25 ± 0.10	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
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 **$\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$** 

VALUE (%)	DOCUMENT ID	TECN	COMMENT	$\Gamma_7/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

2 ± 1	HORN	08A	DPWA Multichannel
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 **$\Gamma(N a_0(980))/\Gamma_{\text{total}}$** 

VALUE (%)	DOCUMENT ID	TECN	COMMENT	$\Gamma_8/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

2 ± 1	HORN	08A	DPWA Multichannel
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 **$\Gamma(\Delta(1232)\eta)/\Gamma_{\text{total}}$** 

VALUE (%)	DOCUMENT ID	TECN	COMMENT	$\Gamma_9/\Gamma$
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**• • • We do not use the following data for averages, fits, limits, etc. • • •**

4 ± 2	HORN	08A	DPWA Multichannel
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DESIG=1

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DESIG=14

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## $\Delta(1940)$ PHOTON DECAY AMPLITUDES

Papers on  $\gamma N$  amplitudes predating 1981 may be found in our 2006 edition,  
Journal of Physics, G **33** 1 (2006).

### $\Delta(1940) \rightarrow N\gamma$ , helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV <sup>-1/2</sup> )	DOCUMENT ID	TECN	COMMENT
$-0.036 \pm 0.058$	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
$0.160 \pm 0.040$	HORN	08A	DPWA Multichannel

### $\Delta(1940) \rightarrow N\gamma$ , helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV <sup>-1/2</sup> )	DOCUMENT ID	TECN	COMMENT
$-0.031 \pm 0.012$	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
$0.110 \pm 0.030$	HORN	08A	DPWA Multichannel

### $\Delta(1940)$ FOOTNOTES

<sup>1</sup> LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to  $\pi N \rightarrow N\pi\pi$  data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.

### $\Delta(1940)$ REFERENCES

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
HORN	08A	EPJ A38 173	I. Horn <i>et al.</i>	(CB-ELSA Collab.)
Also		PRL 101 202002	I. Horn <i>et al.</i>	(CB-ELSA Collab.)
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA) IJP
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)
CANDLIN	84	NP B238 477	D.J. Candlin <i>et al.</i>	(EDIN, RAL, LOWC)
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)
Also		NP B197 365	K. Fujii <i>et al.</i>	(NAGO)
CHEW	80	Toronto Conf. 123	D.M. Chew	(LBL) IJP
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL)
LONGACRE	78	PR D17 1795	R.S. Longacre <i>et al.</i>	(LBL, SLAC)

NODE=B136235

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